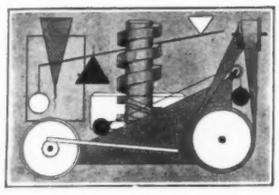
MACHINE DESIGN

as it affects

ENGINEERING–PRODUCTION–SALES

Volume 4 **December, 1932** **Number 12**



Forthcoming ISSUES

MOST engineers responsible for design have had actual shop experience. Others possess sufficient knowledge of shop practice to be able to visualize production difficulties. In all cases, however, unless close contact is maintained with manufacturing processes design is bound to suffer.

The new series of articles commencing with the leading contribution in this issue has been planned to assist the designer to polish up his knowledge of shop problems. Future articles will be as practical as the current one on founding.

L. E. Jermy

CONTENTS

(FOR COMPLETE ITEMIZED INDEX OF CONTENTS, SEE PAGE 7)

	Page
Considering Design from the Production Standpoint—Part—1 Founding *By Harold F. Shepherd*	15
Scanning the Field for Ideas	19
Supplementing Mechanical Efficiency with Good Appearance *By Walter Dorwin Teague*	22
Stress Problems Are Discussed	26
Splash Lubrication Fails at Subcritical Speed *By W. H. Himes*	27
Unitization—Logical Sequence to Interchangeability of Parts *By Arthur H. Adams*	29
Control of Motion Solved in Power Shovel *By J. D. Rauch*	33
Spring Design Must Take Into Account Inactive Coils *By R. F. Vogt*	37
Reduction in Capital Costs Should Be Aim in Current Design (Editorial)	40
Thomas A. Edison—Master Designer	42

Professional Viewpoints	43	Topics of the Month	54
Men of Machines	46	New Materials and Parts	58
Leaders in Design	47	Manufacturers' Publications	70
Obituaries	49	Research Publications	70
How is Business?	50	Advertising Index	72
Noteworthy Patents	51	Calendar of Meetings	12

FRANKLIN H. JOHNSON, *Publisher*

L. E. JERMY ..... *Editor*

ALLEN F. CLARK
HAROLD B. VEITH
F. H. BURGESS

W. C. KREMSER ..... *Circulation Manager*

J. F. AHRENS ..... *Eastern Manager*
220 Broadway, New York, Cortland 7-4594

HOWARD H. DREYER ..... *Western Manager*
1347 Peoples Gas Bldg., Chicago, Harrison 7506

VINCENT DELPORT..... *European Representative*
Penton Publishing Co. Ltd., Caxton House, Westminster, London, S.W.1

Published on the tenth of each month. Subscription rates: U. S. and Possessions, two years $5; one year $3. Single copies, 35 cents. Canada, two years $6; one year $3.50, including duty. Europe, two years £2; one year £1.4.0.

Copyright, 1932, by

THE JOHNSON PUBLISHING CO., PENTON BUILDING, CLEVELAND, OHIO

Affiliated with The Penton Publishing Co.

Seeing is Believing. Sample Free.

Ball bearings outlast plain bearings because they reduce wear considerably. Friction is eliminated almost entirely. And dirt, the worst enemy of any bearing, may be barred more effectively.

Until New Departure engineers introduced the revolutionary idea of seals integral with the bearing, each machine builder was compelled to make and install a multiplicity of small parts — a slow and expensive procedure.

No wonder the N-D-Seal gained instant popularity. The cutaway view tells you the story. Only the finest woven felt is used for seal material. Tearing is prevented by glass-smooth metal surfaces. The overhung shield makes a most effective protection against injury to bearing from foreign matter.

Each bearing is filled at the factory with sufficient and proper lubricant for several seasons of service.

Scores of instances can be cited in which N-D-Seals are performing with great success at speeds of ten thousand to thirty thousand r. p. m.

Send for a sample N-D-Seal and a booklet describing its many advantages. This offer is limited to engineers and executives who write on their company letterhead, telling where they read this ad. The New Departure Mfg. Company, Bristol, Conn.; Detroit, Chicago.

NEW DEPARTURE BALL BEARINGS

NITE

Machine Design is as definite as its name. It is a definite publication, serving a very definite field. The function of Machine Design is that of a conveyor of ideas on design from one type of machinery manufacturer to all others. It carries the most advanced and authoritative information on methods, materials and parts.

Machine Design is not a medium for everything—but for Manufacturers of materials, parts and accessories which are designed into the machines of America—Machine Design has a definite, tangible value. We should like to tell you about this value—in terms of your product. We have helped others—some by advising against the use of Machine Design—some by showing how their product fits into the design function—to their ultimate profit.

May we tell you the whole story?

Machine Design is published by The Johnson Publishing Company, Penton Building, Cleveland, Ohio. Affiliated with The Penton Publishing Company.

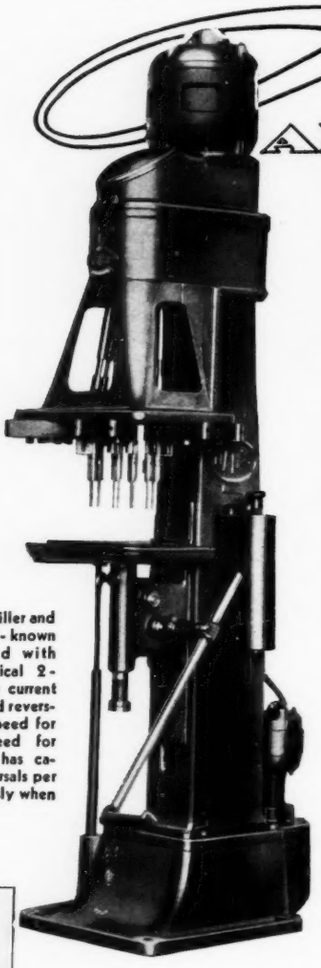
DESIGN

LOUIS ALLIS

Squirrel Cage REVERSING MOTOR

delivering

"MORE THAN HORSEPOWER"



New Multiple Driller and Tapper of well-known make, equipped with Louis Allis vertical 2-speed alternating current squirrel cage rapid reversing motor; high-speed for drilling; low-speed for tapping. Motor has capacity of 50 reversals per minute continuously when tapping.

Previous design of Multiple Driller and Tapper shown above. An ordinary motor was used. Consequently, belts, pulleys, a shifter clutch, and tripping mechanism were needed to reverse the spindles.

25 operating cycles per minute, the capacity of this new multiple driller and tapper, is machine performance extraordinary. And it took an extraordinary driving motor to make this possible.

Making 50 reversals per minute continuously, without over-heating, this Louis Allis 2-speed rapid reversing motor delivers more than "so much horsepower". It creates and improves machine performance . . . eliminating the belts, pulleys, shifter clutch, and tripping mechanism formerly used to reverse the spindles when tapping.

This illustrates how machine builders now are capitalizing the hidden advantages in correct motor design and precise application. For L.A. motors, designed for *definite results*, are delivering "More Than Horsepower" on all types of production machines.

Louis Allis engineers will gladly help *you* build better performance, appearance, and sales appeal into *your* product. Write for literature, and tell us your problem.

Pipe-Ventilated

Totally Enclosed Fan-Cooled

Explosion-Proof

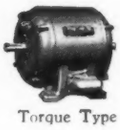
Wound-Rotor

Direct Current

Head-Stock Type

Vertical

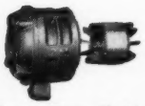
Flange-Mounted

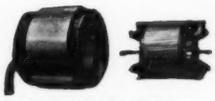

Torque Type

Standard Single or Multi-Speed

Self-Cleaning

Drip-Proof


Frame Type Shaftless


Rolled Shell Shaftless

Arbor Type

Hoist Type

SINCE 1901

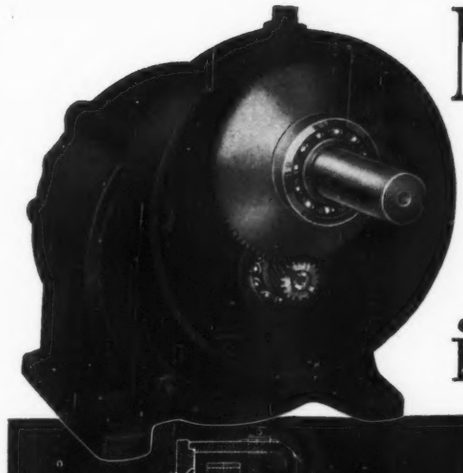
STANDARD AND CUSTOM BUILT MOTORS

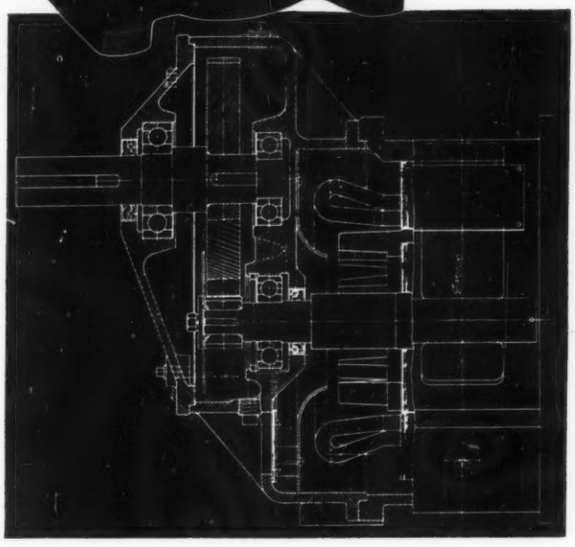
THE LOUIS ALLIS CO. MILWAUKEE, WIS.

New Gearmotor-

the Dragon announces-

is Fafnir Equipped!





A new Westinghouse solution of the mechanical transmission problem is the gearmotor—a neat, highly efficient and inexpensive combination electric motor and speed reducer. Made in three types, for drives from ½ to 75 horse-power, and with ratios ranging up to 40 to 1, it can be readily seen that with customary thoroughness, Westinghouse has covered the field completely.*

This gearmotor is the culmination of 10 years' testing and experimentation. Thus the specification of Fafnir Ball Bearings is no empty honor. The selection of Fafnirs was influenced by the extra strength and capacity inherent in the large balls, deep races and high quality characteristics of this line. Required features of the new gearmotor are compactness, flexibility, simplicity, efficiency, quietness and low upkeep cost. Fafnir Ball Bearings assist to a great degree in obtaining these ends.

Fafnir has much to offer builders of every type of machinery. Able to choose from "the most complete line of types and sizes in America," the engineering staff in its recommendations can assure the selection of the bearing exactly suited to the job. The use of Fafnir facilities and Fafnir anti-friction experience will do much to make even the finest product better, more efficient, longer-lived. This service is yours for the asking.

**A recent issue of The Dragon told the complete story of the new Westinghouse Gearmotor and why it is Fafnir-equipped. Every issue has equally interesting ball bearing information. Would you like to be on our mailing list?*

THE FAFNIR BEARING COMPANY, New Britain, Conn.

Atlanta Chicago Cleveland Dallas Detroit
Los Angeles Milwaukee Newark New York Philadelphia

Fafnir·Ball·Bearings

Calendar of Meetings and Expositions

Dec. 14—Malleable Iron Research Institute. Annual meeting to be held at Cleveland. Robert E. Belt, Union Trust building, Cleveland, is secretary of the organization.

Jan. 7-14—National Automobile Show. Annual exhibition to be held at Grand Central Palace, New York.

Jan. 12—Society of Automotive Engineers. Annual dinner held by the society is scheduled for New York. John A. C. Warner, 29 West Thirty-ninth street, New York, is secretary.

Jan. 15—American Engineering council. Annual meeting to be held at Washington hotel, Washington. L. W. Wallace, 744 Jackson Place, Washington, is executive secretary of the council.

Jan. 16-21—Steel Founder's Society of America. To hold annual meeting at Detroit. G. P. Rogers, 932 Graybar building, New York, is managing director of the society.

Jan. 16-20—American Road Builders' association. Annual meeting and road show to be held in Detroit coincident with the Highway and Building congress and the meetings of twenty national associations. Road machinery and similar equipment will be displayed. Charles M. Upham, National Press building, Washington, is engineer-director of the road builders' association.

Jan. 20-28—National Power Boat Show. Annual exhibition sponsored by National Association of Engine and Boat Manufacturers will be held at Grand Central Palace, New York, and include power boats, engines, parts and accessories.

Jan. 23-25—American Society of Heating and Ventilating Engineers. Thirty-ninth annual meeting and exposition of equipment to be held at Hotel Gibson, Cincinnati, O. A. V. Hutchinson, 51 Madison avenue, New York, is secretary of the society.

Jan. 23-26—Society of Automotive Engineers. Annual meeting to be held at Book-Cadillac hotel, Detroit. John A. C. Warner, 29 West Thirty-Ninth street, New York, is secretary.

Jan. 23-27—American Institute of Electrical Engineers. Winter meeting of the society is to be held in New York. H. H. Henline, 33 West Thirty-Ninth street, New York, is acting national secretary of the society.

March 7-10—American Management association. Annual packaging, packing and shipping exposition to be held at Hotel Pennsylvainia, New York. Roberts Everetts associates, 225 West Thirty-fourth street, New York, are exposition managers.

March 7-10—Package Machinery Manufacturers. Meeting to be held in New York during annual packaging exposition. H. H. Leonard, Consolidated Packaging Machinery Corp., New York, is chairman of the meeting committee.

March 13-16—National Railway Appliance Exhibition. To be held at Chicago. C. W. Kelly, 1014 South Michigan avenue, Chicago, is manager of the exhibition.

March 15-17—American Railway Engineering association. Annual meeting to be held in Chicago. E. H. Fritch, 59 East Van Buren street, Chicago, is secretary of the association.

March 26-April 1—American Chemical society. Eighty-fifth meeting to be held at Washington. Dr. Charles L. Parsons, 728 Mills building, Washington, is secretary of the society.

April 26-28—American Welding society. Annual meeting to be held in Engineering Societies building, New York. M. M. Kelly, 33 West Thirty-ninth street, New York, is secretary of the society.

May 11-13—Electrochemical society. Spring meeting to be held at Montreal, Que., Dr. Colin G. Fink, Columbia university, New York, is secretary of the society.

June 11-16—American Oil Burner association. Tenth annual meeting and exposition of equipment to be held at Hotel Stevens, Chicago. Harry F. Tapp, 342 Madison avenue, Chicago, is secretary of the association.

June 12-15—National Association of Purchasing Agents. Exposition and annual meeting to be held at Hotel Statler, Boston. G. A. Renard, 11 Park Place, New York, is secretary of the association.

June 19-22—American Foundrymen's association. To hold annual meeting and exhibition of equipment at Hotel Stevens, Chicago. C. E. Hoyt, 222 West Adams street, Chicago, is secretary of the association.

Drawing Board Conferences gain these savings in Motor Control . . .

★

ENGINEERS who design the machines which cut the costs of Industry no longer need to be told the advantages of incorporating Motor Control as an integral part of their product.

Such engineers realize that only by building the proper control into their designs can they be certain their customers will secure all the cost-saving advantages of the new machines.

But not always do they realize the increased savings in their own manufacturing costs made possible by consulting with Motor Control experts while the machines are still in the blueprint stage. Savings in production costs, by doing electrically what requires complicated mechanism to do mechanically. Savings made possible by building "standard" control into the machines, rather than adapting "special" (and therefore more costly) control to the machine after it is built.

To gain full savings from Motor Control, have a drawing board conference with Cutler-Hammer engineers before you release your new machine for production. If "standard" stock Motor Control units can be adapted, you gain the advantages of dealing with one of the largest control manufacturers. If "special" Motor Control is required, Cutler-Hammer engineers have unsurpassed experience and facilities to provide it.

To your customers, Motor Control identified by the famous C-H trade-mark is a known value. No Motor Control adds more to machine performance. None adds so much to its saleability. CUTLER-HAMMER, INC., *Pioneer Manufacturers of Electric Control Apparatus,* 1310 St. Paul Ave., Milwaukee, Wis.

The designing and building of Motor Control is a separate and distinct division of electrical engineering. The place to go for consultation and advice on Motor Control problems is to a control specialist. Cutler-Hammer indisputably qualifies as such a specialist. Your problems will be welcomed here. A letterhead request brings the C-H Catalog.

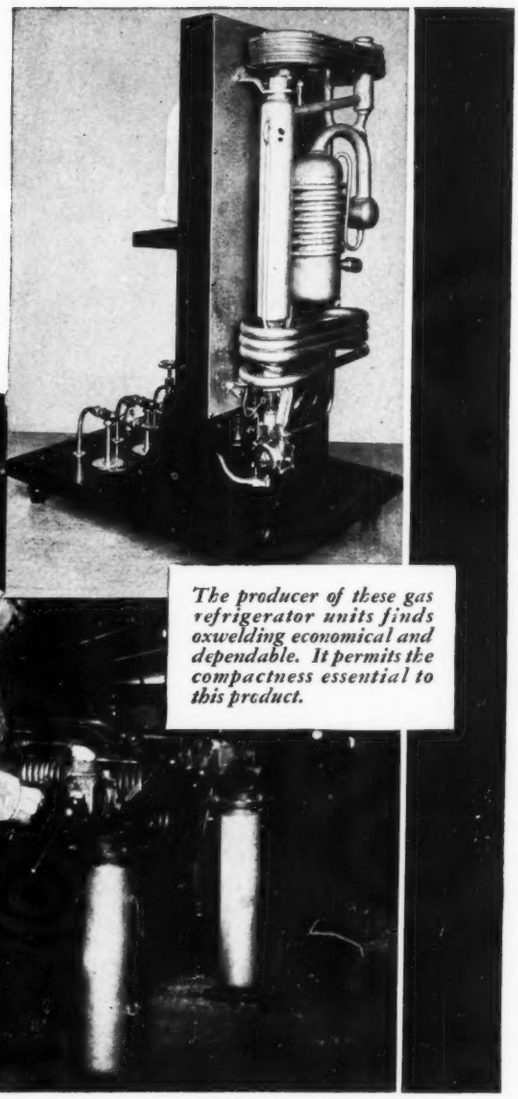
★

CUTLER HAMMER

The Control Equipment Good Electric Motors Deserve

(A-6336)

DESIGN IT FOR *welding—*



The producer of these gas refrigerator units finds oxwelding economical and dependable. It permits the compactness essential to this product.

and design it RIGHT

IF YOU have considered redesigning your product for welded construction, read this timely suggestion from METAL PROGRESS:

"Seldom will it be found economical to take the drawings of a riveted structure and say, 'For each rivet we will put in a 1-in. weld.' Nor will there be much profit in reproducing a steel casting out of bits of plate, angle iron, and I-beams . . . New and searching studies are necessary to find out what parts of such old designs are really essential and what portions have been added as conveniences or necessities for the conventional methods of construction. Certainly it is a job which cannot be done without the guidance of expert engineering."

From its unequaled background of scientific research and experience in the field of oxy-acetylene welding and cutting the Linde organization has a wealth of informative data which assures the *guidance of expert engineering* in weld design. If you feel that this experience would be helpful to you in connection with your products the nearest Linde District Office will gladly cooperate with you. Why not telephone or write them today?

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants UCC 627 Warehouse Stocks

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

District Offices

Atlanta	Detroit	New York
Baltimore	El Paso	Philadelphia
Birmingham	Houston	Pittsburgh
Boston	Indianapolis	St. Louis
Buffalo	Kansas City	Salt Lake City
Chicago	Los Angeles	San Francisco
Cleveland	Milwaukee	Seattle
Denver	Minneapolis	Tulsa

LINDE OXYGEN · PREST-O-LITE ACETYLENE · OXWELD APPARATUS AND SUPPLIES · UNION CARBIDE

Single Close Coupled Type Twin Disc Clutch

. . . . "BECAUSE

WE COULD BUY THEM CHEAPER

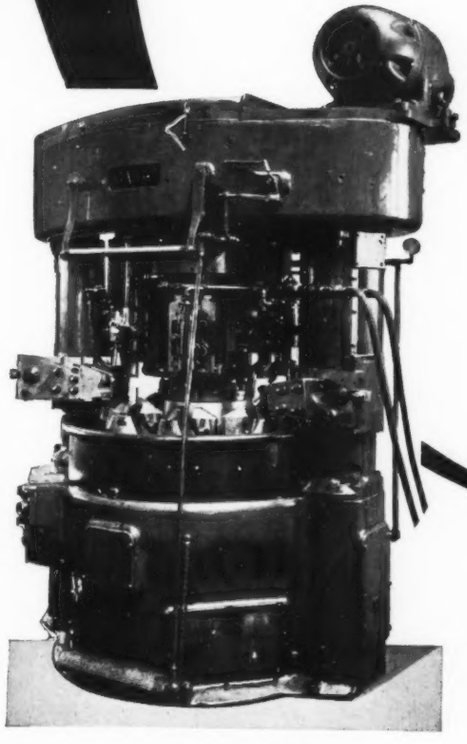
THAN WE COULD BUILD THEM"

. . . that's what the makers of the Baird Automatic Lathe have to say about the *cost economy* of Twin Disc Clutches. Their many *performance economies*—the fact that Twin Disc Machine Tool Clutches combine compactness with capacity, adaptability with accessibility, to give easier, more positive control while assuring speedier and greater production — is another story.

Now let's just consider why you actually save by equipping with Twin Disc Clutches. Take the close-coupled type clutch for instance. There's a size and type for practically every machine tool need — 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10 and 12 inches; either single, as shown, or duplex; oil or dry plate — all easily adaptable to your individual design.

Specialized facilities, precision workmanship and volume production — that's why Twin Disc engineers can eliminate for you the hazards, responsibilities, and high costs of manufacturing your own clutches in small quantities.

Your aim, when re-designing, is greater value at less cost. Then why not let Twin Disc Engineers help you? Write in detail for specific recommendations. Engineering Data Book on request. No obligation, of course. *Twin Disc Clutch Company, 1325 Racine St., Racine, Wis.*



AUTOMATIC
8-SPINDLE
VERTICAL
LATHE

●

The Baird
Machine Co.
Bridgeport
Connecticut

TWIN DISC
CLUTCHES

DIVINE DISCONTENT

The propelling force in man . . . that urge to improve what he has already done well . . . is, in the words of Plato, a "divine discontent."

The unceasing efforts of Leland engineers to make the Leland motor better and better . . . and still better . . . aptly illustrates what that eminent philosopher had in mind.

To illustrate: It is common knowledge that motors for oil burners, stokers, air conditioners and refrigerators must be QUIET. Consequently, all inherent noises and sources of noise must be isolated within the motor itself. Transmitted vibration must be eliminated. How well that has been accomplished in the Leland cradle base design is well known. That which is not so well known is the fact that Leland engineers finished the job—went farther—designed a mounting that would "stay put" regardless of weight, belt pull, load thrust and other tendencies to dislocate the motor shaft with respect to the motor base and the driven load.

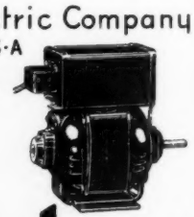
Can you rest content with any motor other than the best for your requirement?

A. C. Repulsion-Induction D. C. and Polyphase Capacitor motors Specials where required

The Leland Electric Company
Dayton · Ohio · U·S·A

CANADIAN ADDRESS
TORONTO

CABLE ADDRESS
LELECT



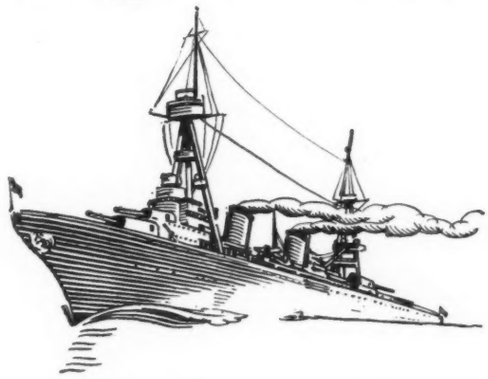
Leland Motors

INDEX TO ADVERTISERS

Alemite Corp.	—
Allen Mfg. Co.	68
Allis, Louis, Co.	10
Allis-Chalmers Mfg. Co.	—
Armstrong Cork & Insulation Co.	63
Baldwin-Duckworth Chain Corp.	Inside Back Cover
Century Electric Co.	61
Chain Belt Co.	—
Chicago Rawhide Mfg. Co.	4
Cutler-Hammer, Inc.	13
Diamond Chain & Mfg. Co.	59
Dietzgen, Eugene, Co.	—
Dodge Mfg. Corp.	—
Dumore Co.	69
Electro Metallurgical Sales Co.	73
Fafnir Bearing Co.	11
Fairbanks, Morse & Co.	—
Federal Bearing Co., Inc., The	—
General Electric Co.	55
General Fibre Products Co.	—
Geuder, Paeschke & Frey Co.	—
Gurney Ball Bearing Co.	—
Haynes Stellite Co.	—
Hyatt Roller Bearing Co.	—
Industrial Controller Co.	—
Leland Electric Co.	72
Lewellen Mfg. Co.	74
Linde Air Products Co.	14
Link-Belt Co.	3
Marlin-Rockwell Corp.	—
Master Electric Co., The	66
Mechanite Institute	—
Morse Chain Co.	—
New Departure Mfg. Co., The	6
New Jersey Zinc Co.	—
Norma-Hoffmann Bearings Corp.	Inside Front Cover
Ohio Pulley Works, Inc., The	—
Reeves Pulley Co.	57
Rockwood Mfg. Co.	—
Schatz Mfg. Co., The	67
Signal Electric Mfg. Co.	—
S. K. F. Industries, Inc.	—
Square D Company	—
Standard Steel & Bearings, Inc.	—
Strom Ball Bearing Co.	—
Timken Roller Bearing Co.	Back Cover
Twin Disc Clutch Co.	71
Udylite Process Co.	65
Vickers, Inc.	—

MACHINE DESIGN
is a monthly technical publication conceived, edited and directed expressly for those executives and engineers responsible for the creation and improvement of machines built for sale, and for the selection of the materials and parts to be used.

If you want unbiased help in selecting Alloy Steel . .



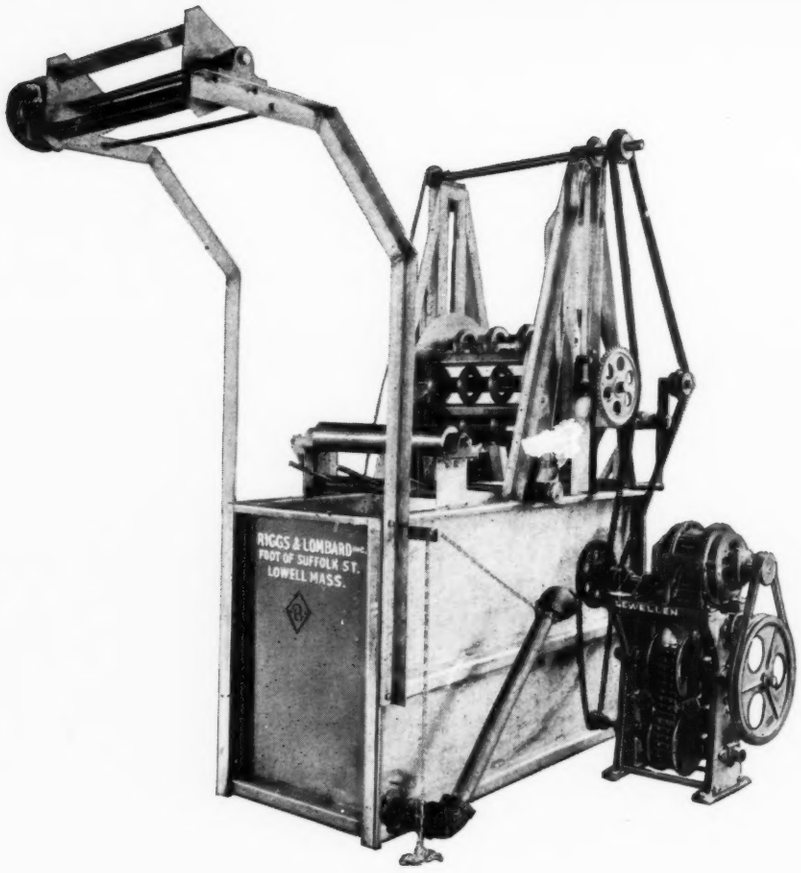
■ With scores of alloy steels available, selecting the few that will do your job best is not easy. To give you practical and unbiased help in this task is the purpose of Electromet Engineering Service. ■ Electromet's suggestions are unbiased because Electromet is not a manufacturer of alloy steels, and favors no one producer or product. Selling ferro-alloys to makers of all kinds of steel, Electromet needs—and has—a vast fund of data on every composition. It is from this up-to-the-minute information that Electromet engineers draw when they study your problem and recommend the steel that will suit it best. ■ Taking advantage of this service will insure the results you expect from alloy steels. You are welcome to it at any time. A request on your letterhead will bring you complete information.

Electromet
Ferro-Alloys & Metals

ELECTRO METALLURGICAL SALES CORP.
Unit of Union Carbide and Carbon Corporation

UCC

CARBIDE and CARBON BUILDING, 30 EAST 42nd ST., NEW YORK, N. Y.



The Lewellen Variable Speed Transmission is incorporated in the design of the new Riggs & Lombard Universal Sample Dye Kettle

Instead of having various size Sample Dye Kettles, for different kinds and yardages of cloth, this Universal Sample Dye Kettle may be used for any length of sample from 2 to 45 yards. The Lewellen Transmission incorporated in the drive, makes possible any reel speed from 4 to 40, making this machine easily and quickly adaptable to approximately 100% of a mill's sample requirements.

The modern textile machine is truly modern when equipped with the Lewellen Variable Speed Transmission. Lewellen engineers will gladly work with you to modernize your machines by supplying accurate variable speed control.

Return the coupon below and our catalog, in which is included engineering data, will be gladly mailed; also any other information you may desire.

The Lewellen Manufacturing Co.,
Columbus, Ind.

I would like your catalog of the Lewellen Variable Speed Transmission. I am interested in accurate variable speed control on .....

Name.....

Company.....

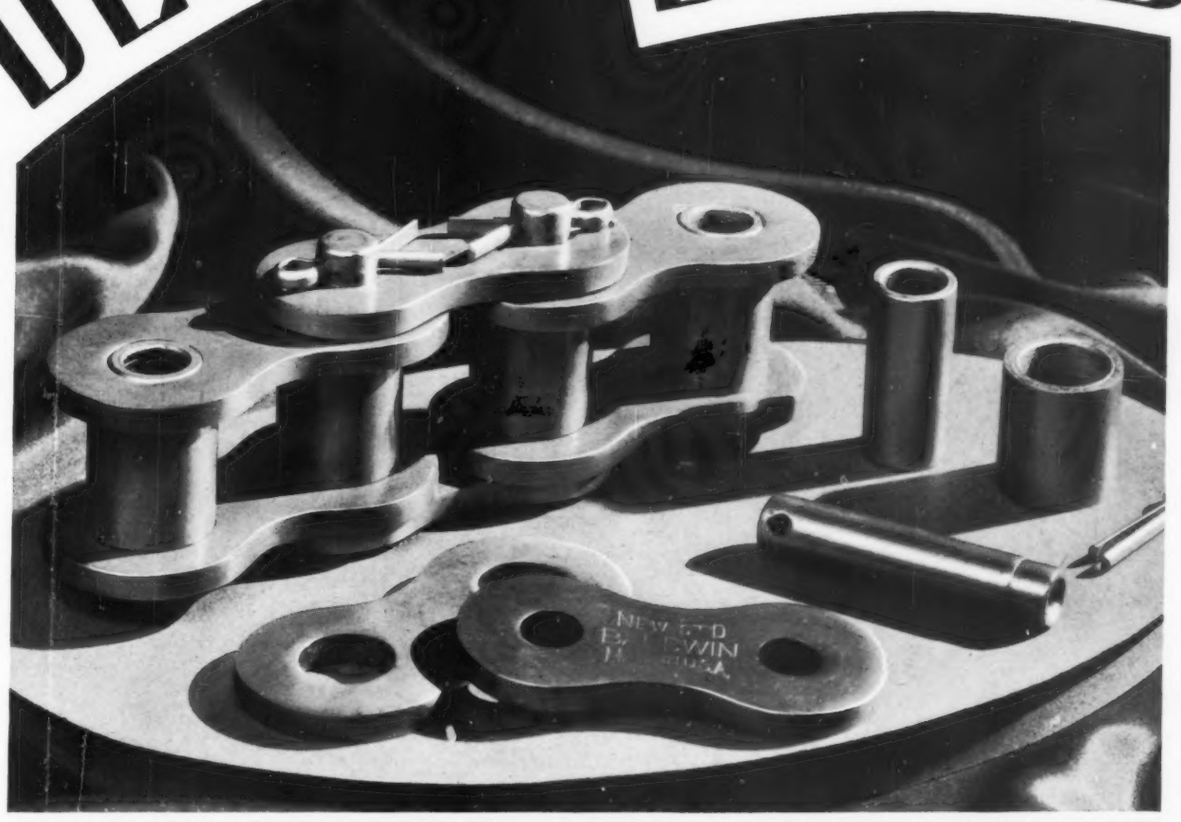
Address.....

THE *Lewellen*

MANUFACTURING CO.

COLUMBUS, INDIANA

DEPENDABLE DRIVES

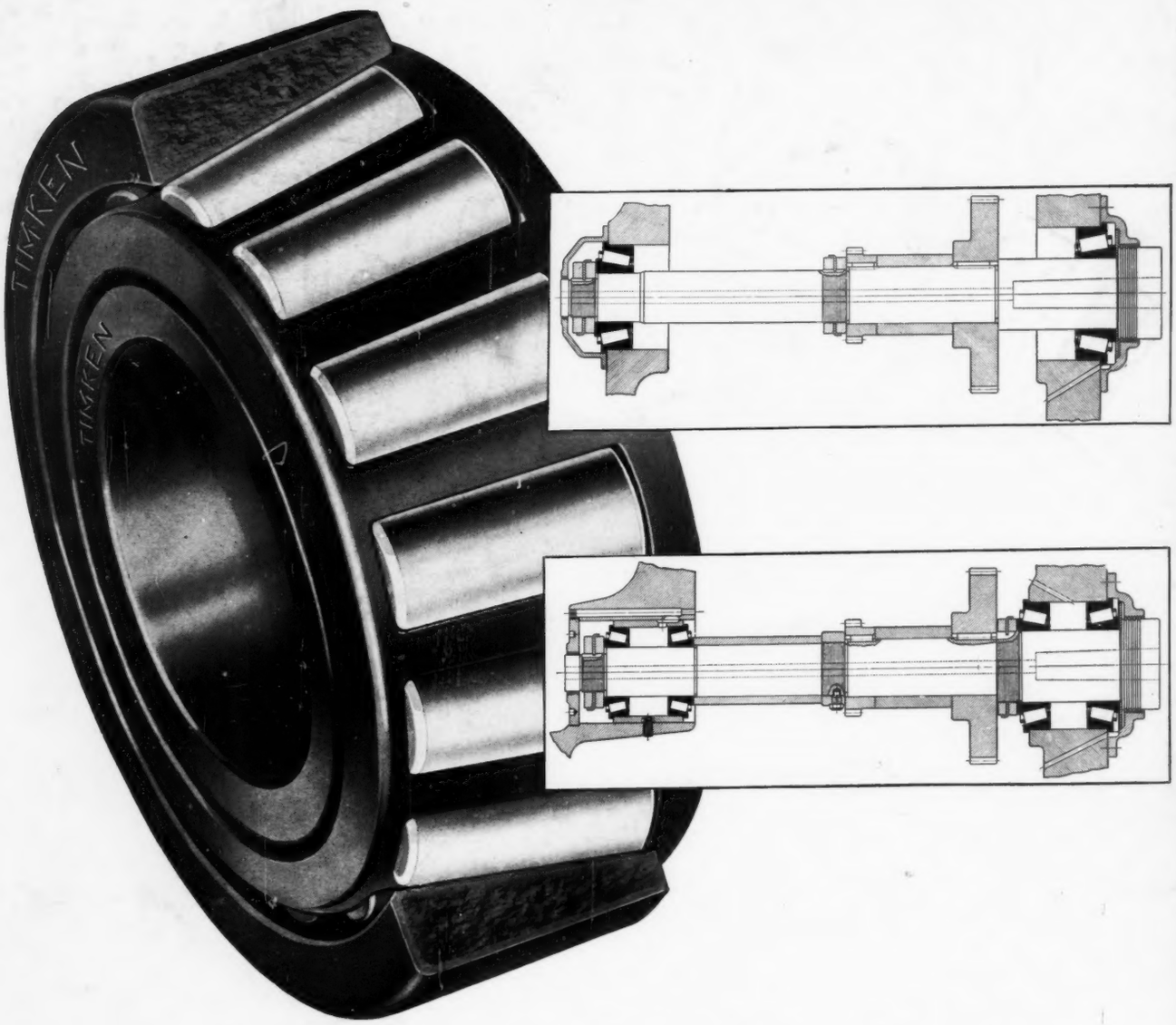


Engineering experience—quality materials—precision workmanship—modern manufacturing facilities—naturally all of these necessary elements and functions are represented in Baldwin-Duckworth Chains and Sprockets. Beyond these essentials, however, is a specialized engineering service, a distinctive phase of Baldwin-Duckworth Chain Corporation's relation to the industrial field. This, more than anything else, is responsible for 42 years of uninterrupted growth. We will welcome an opportunity of explaining in detail this specialized engineering service and its possible application to your business.

BALDWIN-DUCKWORTH CHAIN CORP.

SPRINGFIELD, MASSACHUSETTS

FACTORIES AT SPRINGFIELD AND WORCESTER, MASSACHUSETTS



The rapid adoption of Timken Bearings for machine tool spindles by so many prominent builders is one of the most outstanding developments of the industry. Today it is just as hard to find a heavy duty spindle *not* on Timkens, as it was a few years ago to find one *with* Timkens.

The requirements demanded maximum rigidity, freedom from chatter, absolute accuracy, safe preloading, and lasting endurance. *Timken meets every one of them.* Are your spindles modern if they are not Timken-equipped?

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**